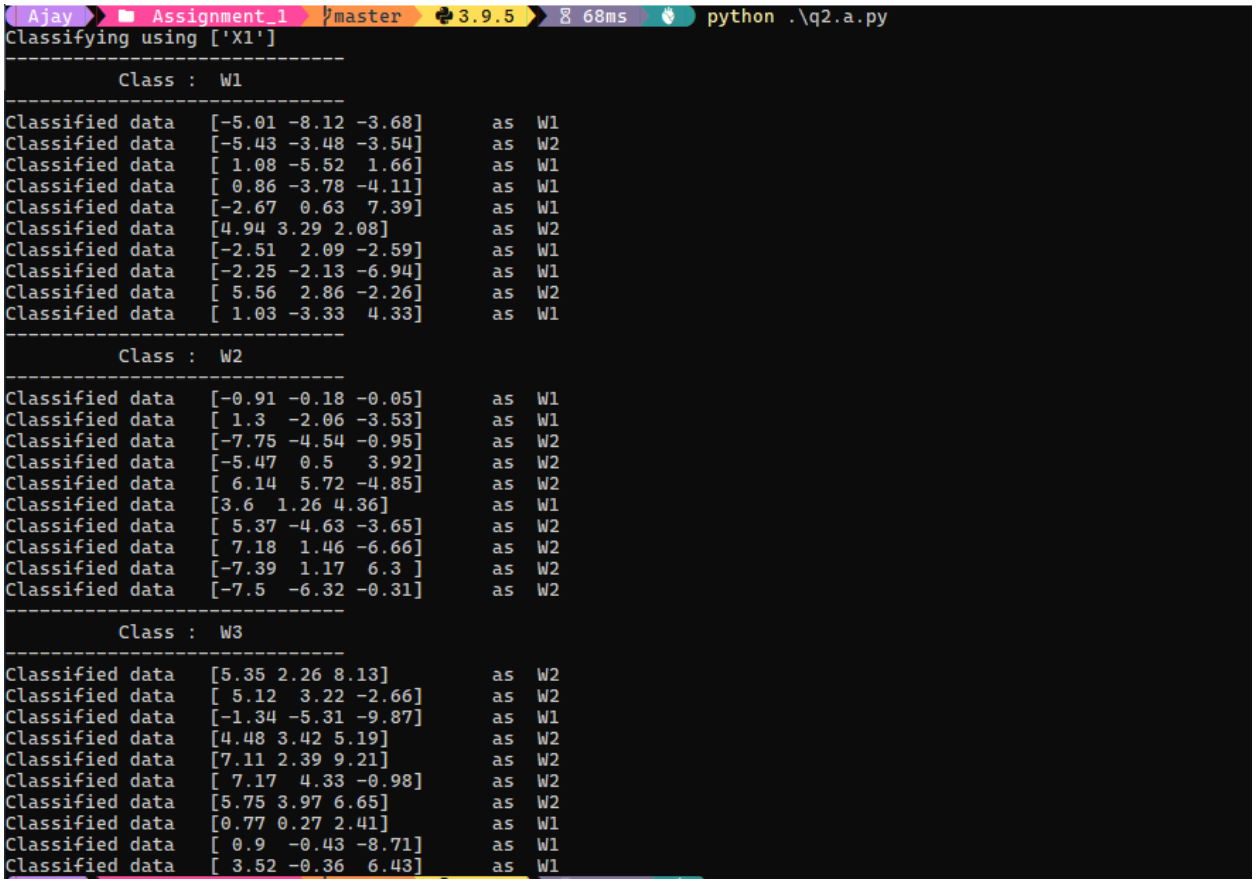
Implementation using python.

Outputs :

2.a



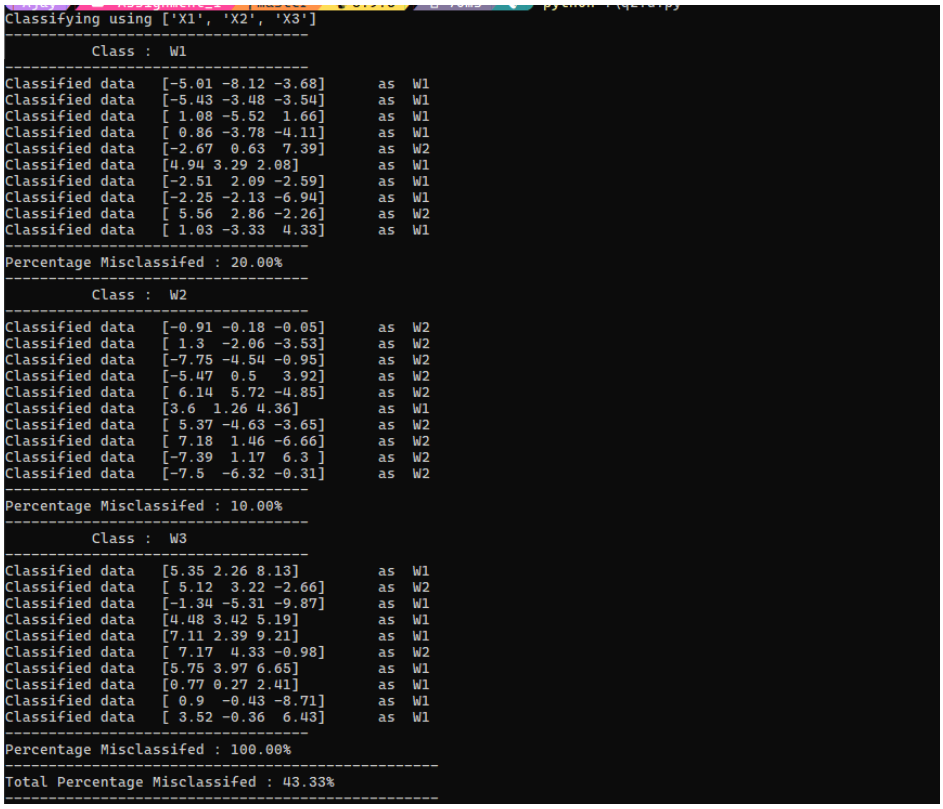
2.b

```
Ajay  Assignment_1  master  3.9.5  69ms  python .\q2.b.py
Classifying using ['X1']
-----------------------------------
          Class :  W1
-----------------------------------
Classified data   [-5.01 -8.12 -3.68]      as  W1
Classified data   [-5.43 -3.48 -3.54]      as  W2
Classified data   [ 1.08 -5.52  1.66]      as  W1
Classified data   [ 0.86 -3.78 -4.11]      as  W1
Classified data   [-2.67  0.63  7.39]      as  W1
Classified data   [4.94 3.29 2.08]         as  W2
Classified data   [-2.51  2.09 -2.59]      as  W1
Classified data   [-2.25 -2.13 -6.94]      as  W1
Classified data   [ 5.56  2.86 -2.26]      as  W2
Classified data   [ 1.03 -3.33  4.33]      as  W1
-----------------------------------
Percentage Misclassifed : 30.00%
-----------------------------------
          Class :  W2
-----------------------------------
Classified data   [-0.91 -0.18 -0.05]      as  W1
Classified data   [ 1.3  -2.06 -3.53]      as  W1
Classified data   [-7.75 -4.54 -0.95]      as  W2
Classified data   [-5.47  0.5   3.92]      as  W2
Classified data   [ 6.14  5.72 -4.85]      as  W2
Classified data   [3.6  1.26 4.36]         as  W1
Classified data   [ 5.37 -4.63 -3.65]      as  W2
Classified data   [ 7.18  1.46 -6.66]      as  W2
Classified data   [-7.39  1.17  6.3 ]      as  W2
Classified data   [-7.5  -6.32 -0.31]      as  W2
-----------------------------------
Percentage Misclassifed : 30.00%
-----------------------------------
          Class :  W3
-----------------------------------
Classified data   [5.35 2.26 8.13]         as  W2
Classified data   [ 5.12  3.22 -2.66]      as  W2
Classified data   [-1.34 -5.31 -9.87]      as  W1
Classified data   [4.48 3.42 5.19]         as  W2
Classified data   [7.11 2.39 9.21]         as  W2
Classified data   [ 7.17  4.33 -0.98]      as  W2
Classified data   [5.75 3.97 6.65]         as  W2
Classified data   [0.77 0.27 2.41]         as  W1
Classified data   [ 0.9  -0.43 -8.71]      as  W1
Classified data   [ 3.52 -0.36  6.43]      as  W1
-----------------------------------
Percentage Misclassifed : 100.00%
-----------------------------------------------------
Total Percentage Misclassifed : 53.33%
-----------------------------------------------------
```

2.c

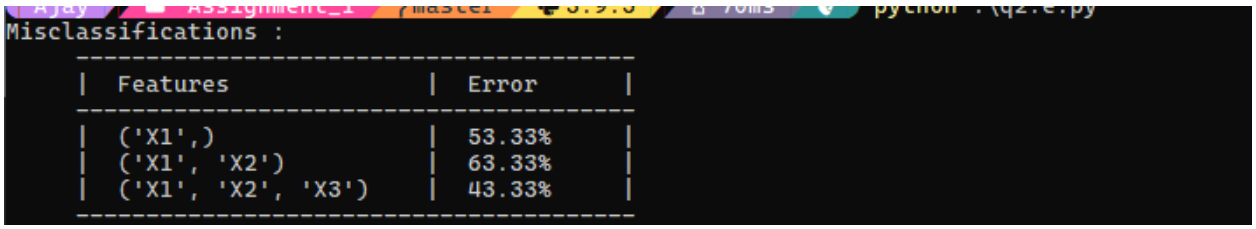
```
Ajay  Assignment_1  master  3.9.5  72ms  python .\q2.c.py
Classifying using ['X1', 'X2']
-----------------------------------
          Class :  W1
-----------------------------------
Classified data   [-5.01 -8.12 -3.68]      as  W1
Classified data   [-5.43 -3.48 -3.54]      as  W2
Classified data   [ 1.08 -5.52  1.66]      as  W1
Classified data   [ 0.86 -3.78 -4.11]      as  W1
Classified data   [-2.67  0.63  7.39]      as  W2
Classified data   [4.94 3.29 2.08]         as  W2
Classified data   [-2.51  2.09 -2.59]      as  W2
Classified data   [-2.25 -2.13 -6.94]      as  W1
Classified data   [ 5.56  2.86 -2.26]      as  W2
Classified data   [ 1.03 -3.33  4.33]      as  W1
-----------------------------------
Percentage Misclassifed : 50.00%
-----------------------------------
          Class :  W2
-----------------------------------
Classified data   [-0.91 -0.18 -0.05]      as  W1
Classified data   [ 1.3  -2.06 -3.53]      as  W1
Classified data   [-7.75 -4.54 -0.95]      as  W2
Classified data   [-5.47  0.5   3.92]      as  W2
Classified data   [ 6.14  5.72 -4.85]      as  W2
Classified data   [3.6  1.26 4.36]         as  W1
Classified data   [ 5.37 -4.63 -3.65]      as  W2
Classified data   [ 7.18  1.46 -6.66]      as  W2
Classified data   [-7.39  1.17  6.3 ]      as  W2
Classified data   [-7.5  -6.32 -0.31]      as  W1
-----------------------------------
Percentage Misclassifed : 40.00%
-----------------------------------
          Class :  W3
-----------------------------------
Classified data   [5.35 2.26 8.13]         as  W2
Classified data   [ 5.12  3.22 -2.66]      as  W2
Classified data   [-1.34 -5.31 -9.87]      as  W1
Classified data   [4.48 3.42 5.19]         as  W1
Classified data   [7.11 2.39 9.21]         as  W2
Classified data   [ 7.17  4.33 -0.98]      as  W2
Classified data   [5.75 3.97 6.65]         as  W2
Classified data   [0.77 0.27 2.41]         as  W1
Classified data   [ 0.9  -0.43 -8.71]      as  W1
Classified data   [ 3.52 -0.36  6.43]      as  W1
-----------------------------------
Percentage Misclassifed : 100.00%
-----------------------------------------------------
Total Percentage Misclassifed : 63.33%
-----------------------------------------------------
```

2.d



```
Classifying using ['X1', 'X2', 'X3']
-----------------------------------
         Class :  W1
-----------------------------------
Classified data   [-5.01 -8.12 -3.68]      as  W1
Classified data   [-5.43 -3.48 -3.54]      as  W1
Classified data   [ 1.08 -5.52  1.66]      as  W1
Classified data   [ 0.86 -3.78 -4.11]      as  W1
Classified data   [-2.67  0.63  7.39]      as  W2
Classified data   [4.94 3.29 2.08]         as  W1
Classified data   [-2.51  2.09 -2.59]      as  W1
Classified data   [-2.25 -2.13 -6.94]      as  W1
Classified data   [ 5.56  2.86 -2.26]      as  W2
Classified data   [ 1.03 -3.33  4.33]      as  W1
-----------------------------------
Percentage Misclassifed : 20.00%
-----------------------------------
         Class :  W2
-----------------------------------
Classified data   [-0.91 -0.18 -0.05]      as  W2
Classified data   [ 1.3  -2.06 -3.53]      as  W2
Classified data   [-7.75 -4.54 -0.95]      as  W2
Classified data   [-5.47  0.5   3.92]      as  W2
Classified data   [ 6.14  5.72 -4.85]      as  W2
Classified data   [3.6  1.26 4.36]         as  W1
Classified data   [ 5.37 -4.63 -3.65]      as  W2
Classified data   [ 7.18  1.46 -6.66]      as  W2
Classified data   [-7.39  1.17  6.3 ]      as  W2
Classified data   [-7.5  -6.32 -0.31]      as  W2
-----------------------------------
Percentage Misclassifed : 10.00%
-----------------------------------
         Class :  W3
-----------------------------------
Classified data   [5.35 2.26 8.13]         as  W1
Classified data   [ 5.12  3.22 -2.66]      as  W2
Classified data   [-1.34 -5.31 -9.87]      as  W1
Classified data   [4.48 3.42 5.19]         as  W1
Classified data   [7.11 2.39 9.21]         as  W1
Classified data   [ 7.17  4.33 -0.98]      as  W2
Classified data   [5.75 3.97 6.65]         as  W1
Classified data   [0.77 0.27 2.41]         as  W1
Classified data   [ 0.9  -0.43 -8.71]      as  W1
Classified data   [ 3.52 -0.36  6.43]      as  W1
-----------------------------------
Percentage Misclassifed : 100.00%
-------------------------------------------------
Total Percentage Misclassifed : 43.33%
-------------------------------------------------
```

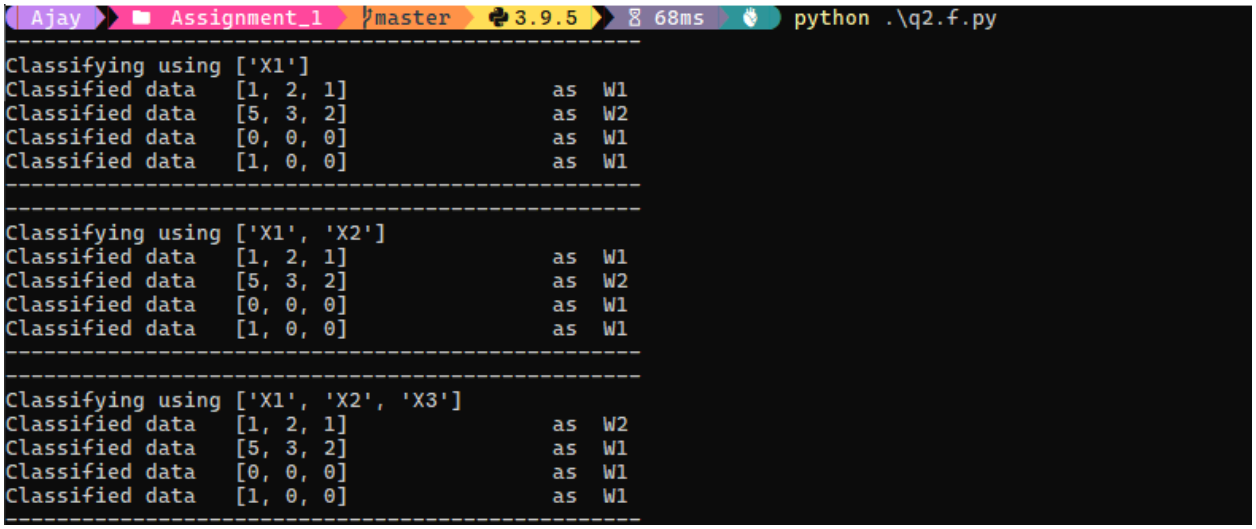
2.e



```
Misclassifications :
     ------------------------------------------
     |  Features              |  Error        |
     ------------------------------------------
     |  ('X1',)               |  53.33%       |
     |  ('X1', 'X2')          |  63.33%       |
     |  ('X1', 'X2', 'X3')    |  43.33%       |
     ------------------------------------------
```

We can see here that the error is least while using all 3 features.Covariance between features is higher when using all three features and making them give more independent data values.

2.f


Ajay Assignment_1 master 3.9.5 68ms python .\q2.f.py
Classifying using ['X1']
Classified data [1, 2, 1] as W1
Classified data [5, 3, 2] as W2
Classified data [0, 0, 0] as W1
Classified data [1, 0, 0] as W1
Classifying using ['X1', 'X2']
Classified data [1, 2, 1] as W1
Classified data [5, 3, 2] as W2
Classified data [0, 0, 0] as W1
Classified data [1, 0, 0] as W1
Classifying using ['X1', 'X2', 'X3']
Classified data [1, 2, 1] as W2
Classified data [5, 3, 2] as W1
Classified data [0, 0, 0] as W1
Classified data [1, 0, 0] as W1